

## 白蚁采食行为中的信息交流

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### Communication in foraging behavior of termites

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- 摘要
- 参考文献
- 相关文章

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#### 摘要

白蚁作为社会性昆虫, 其采食个体间依赖各种信息交流机制进行联系与协作, 其中包括踪迹、警戒、食物信息、同伴识别和助食等。通常的联系信号为挥发性或半挥发性化学物质或者一定频谱和功率的机械振动波。其中踪迹信息素、蚁源烃类、警戒信息素、助食素和机械振动信号等都在白蚁采食过程中起着重要作用。白蚁采食过程中食物定向和食物品质信息的传达主要依靠腹板腺分泌的踪迹信息素, 已发现有十二碳烯醇类、降碳倍半萜类和大环二萜类。蚁源的机械振动也在食物品质表达方面起到一定作用, 但食物品质的表达机制还不明确。白蚁采食协作的基础是同伴识别, 蚁源烃类(C<sub>21</sub>~C<sub>35</sub>)是同伴识别的主要信息物质, 采食个体分泌的助食素则可促成共同取食。警戒信息素传递白蚁采食的安全信息, 通常为一些兵蚁源的萜类物质, 但得到功能鉴定的结构还不多。近来研究还发现特殊的蚁源机械振动也可起到示警作用。已初步证实各种信息交流机制间存在交互作用, 但交互作用的机理有待进一步解析。生物物理因素在白蚁采食行为中的作用值得更多重视。本文以白蚁的采食行为为线索, 评述白蚁采食个体间信息交流机制的研究进展及利用问题, 并对今后的研究提出展望。

#### 关键词:

#### Abstract:

The systematic searching for food in termite society depends on the multiple communication mechanisms among the foraging individuals, including trail-following, alerting, exchanging of food information, nest-mate recognition, phago-stimulation, *etc.* Basic communication signals include volatile or semi-volatile chemicals and mechanical vibrations. Alarm pheromones (soldier derived terpenes), cuticular hydrocarbons (C<sub>21</sub>-C<sub>35</sub>), trail pheromones (dodecenols and terpenes secreted by sternal gland), phagostimulating pheromone, mechanical vibration signals with certain frequency spectrum and power level, *etc.*, are important information carriers in foraging behavior of termite society. Food information including directions, quality and quantity was somewhat shown to be carried by trail pheromones, and as recently discovered mechanic vibrations made by foragers could also transfer food information. Ways to express food quality and quantity information should be clearly understood. Cooperation in foraging was realized through the integration of nest-mate recognition based on the cuticular hydrocarbons and phago-stimulants secreted by the salivary glands, or even the gnawing vibrations as recently discovered in some wood-dwelling termites. Alarm of the foraging process was conducted by alarm pheromones and some special mechanic vibrations made by the stirred foraging individuals. Interactions between food information were seldom known and still need to be further understood. More attention should be paid to the biophysical factors in the termite foraging behavior. With termite foraging behavior as clue, this article reviewed the research works on foraging behavior related to communication mechanisms of termite society such as food information communication, nest-mate recognition and collaboration. Then, some unsolved problems and trends of these research works were put forward.

#### Key words:

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